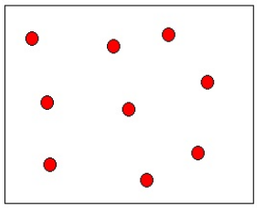
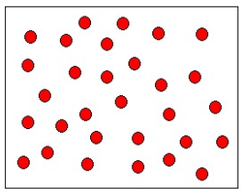
Intermediate Science 7
Unit 3: Mixtures and Solutions
Topic 4 : Concentration and Solubility

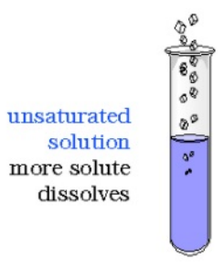
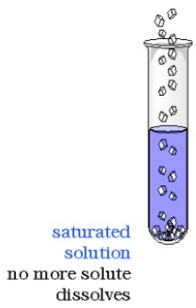
Student Name_____

Concentration: The quantity of solute that is dissolved in a certain quantity of the solvent. Can be described qualitatively or quantitatively.

Qualitatively	Quantitatively
-are descriptions made by observing with the 5 senses, such as the smell of a flower or the colour of someone's eyes. They include observations which cannot be measured.	-are descriptions that are based on measurements or counting (i.e. they are numerical).
Example: -Diluted -Concentrated	Example: - Parts Per Million - g/L or g/mL - Percentage by mass

Dilute	Concentrated
	
Describes a solution that contains less solute than compared to another solution.	Describes a solution that has more solute than compared to another solution.

There is a limit to the concentration of a solution. Eventually you reach a point where the solute will NOT dissolve any more.

Saturated	Unsaturated
Will form when no more solute will dissolve at a certain temperature	More solute is able to dissolve at a certain temperature
	

Concentrated solutions can be:

- Adding more solute and keeping the amount of solvent the same.
- Keeping the amount of solute the same and reducing the amount of solvent.

Solubility: refers to the amount of solute that will dissolve in a given amount of solvent at a given temperature

Rate of dissolving refers to how quickly a solute dissolves in a solvent.

Factors that affect Solubility And Rate of Dissolving:

1. Stirring:

A solute will dissolve more quickly if you stir it.

2. Temperature:

For Solid: As temperature increases = Faster the solute will dissolve

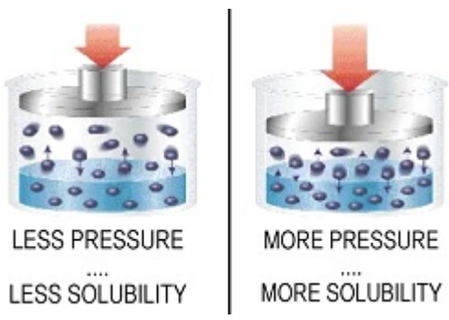
For Gas: As temperature increases = The solubility of a gas generally decreases.

3. Size Of Solute:

Smaller pieces of solute will dissolve more quickly than larger pieces.

4. Pressure:

Gases are more soluble in liquids under higher pressure.



PART A: MULTIPLE CHOICE

Instructions: Shade the letter of the correct answer on the computer scorable answer sheet provided.

1. Which of the following refers to the amount of material dissolved in a measure of liquid?

   (A) Concentration
   (B) Dilute
   (C) Solution
   (D) Volume

2. Which of the following is used to make a qualitative description?

   (A) Your bath scales
   (B) Your Eyes
   (C) A measuring Tape
   (D) A rain gauge

3. Which of the following is a quantitative description?

   (A) The glass is half full
   (B) It is warm in the physics lab
   (C) The lemon tastes sour
   (D) The mass the cat is 2.0 kg

4. Which of the following is a qualitative description of a solution?

   (A) It is diluted
   (B) 100 parts per million
   (C) 10 % per mass
   (D) 100 g/ml

5. Which of the following sugar solutions is the most concentrated?

   (A) 2 g of sugar in 100 mL of water
   (B) 12 g of sugar in 30 mL of water
   (C) 15 g of sugar in 25 mL of water
   (D) 25 g of sugar in 60 mL of water

6. How would you dilute a solution?

   (A) Add more powder
   (B) Add more water
   (C) Add more citric acid
   (D) Add more salt

7. If we increase the amount of solute in a solution , but do not add any additional water. What will happen to the concentration?

   (A) The concentration will go down.
   (B) The concentration will go up.
   (C) The concentration will stay the same.
   (D) Not enough information is given

8. Which of the following refers to a particular solution which cannot dissolve more solute at a particular temperature?

(A) Diluted
(B) Saturated
(C) Solubility
(D) Unsaturated

9. Which of the following is true for an unsaturated solution?

(A) Cannot dissolve more solute
(B) Cannot add more solvent
(C) Can add more solute
(D) Cannot be made

10. When making jello, you accidentally use twice as much jello powder as the recipe calls for. You stir and stir, but you cannot get all of the jello to dissolve. How would you describe the solution?

(A) Diluted
(B) Saturated
(C) Solubility
(D) Unsaturated

11. What is solubility ?

(A) The amount of solvent that will dissolve a given amount of a solute at any temperature
(B) The amount of solute that will dissolve in a given amount of solvent at any temperature
(C) The process of dissolving a solute in a solvent
(D) The amount of solute that will dissolve in a given amount of solvent at a certain temperature

12. Which of the following statements concerning factors that affect solute solubility is incorrect?

(A) Most solid solutes become more soluble in water with increasing temperature.
(B) Most solid solutes become less soluble in water with decreasing pressure.
(C) Gaseous solutes become less soluble in water with increasing temperature.
(D) Gaseous solutes become more soluble in water with increasing pressure.

13. In which the following cases is pressure a factor in the solubility of the solute in the solvent?

(A) Sugar is dissolved in water.
(B) Alcohol is dissolved in water.
(C) Acetylene gas is mixed with oxygen in a blowtorch.
(D) Carbon dioxide is dissolved in sparking wine.

14. Which of the following is true by increasing the temperature of the solvent?

(A) Increases the solubility of solid, liquid and gaseous solutes
(B) Decreases the solubility of gaseous solute
(C) Increases the solubility of liquid solutes more than solid solutes
(D) Affects the solubility of solid solutes only

15. You and your friend have a contest to see who can make iced tea the fastest. Which of the following would NOT help you win?

(A) Cooling the water
(B) Using smaller crystals
(C) Heating the water
(D) Stirring quickly

16. When you measure how fast a solute dissolves, what are you measuring?

(A) Amount of dissolving
(B) Rate of particle movement
(C) Amount of particle movement
(D) Rate of dissolving

17. Why do smaller pieces of solute dissolve faster?

(A) More surface area is exposed
(B) They can be stirred faster
(C) Smaller pieces are unsaturated
(D) They won't form crystals quickly

18. What happens when you stir a solute/solvent mixture?

(A) Does not affect the rate of dissolution
(B) Increases the solubility of the solute in the solvent
(C) Increases the capacity of the solvent to dissolve the solute
(D) Makes the solute dissolve faster

PART B : MATCHING **[5]**

Match each thermometer on the left with the best Descriptor on the right. Each Descriptor may be used only once. Place your answer on the scantron

Term	**Descriptor**
19.___Concentration	A. More solute is able to be dissolved at a certain temperature
20.____ Diluted solution	B. Will form when no more solute will dissolve at a certain temperature
21.___ Concentrated solution	C. A solution with low concentration of solute
22.___Saturated	D. A solution with high amount of solute
23.___ Unsaturated	E. The quantity of solute that is dissolved in a certain quantity of the solvent at a particular temperature.

PART C: WRITTEN RESPONSE

1. You put three teaspoons of sugar in jug with half a litre of water. You put two teaspoons of sugar in a second jug with half a litre of water. Which jug is more concentrated?

2. How is the qualitative definition of concentration different from the quantitative definition?

3. What is the difference between a saturated solution and an unsaturated solution?

4. How does the size of the solute affect the rate of dissolving?

5. What happens to carbon dioxide gas when the pressure on a solution of pop is reduced?

6. Suppose that you add some solid detergent to the water in a washing machine. Then, you decide that your clothes are really dirty, so you add more detergent. Is the solution of detergent and water now more concentrated or more dilute? Explain how you know.

7. To keep roads safer in winter, road crews often spread salt on the roads to melt ice and snow. Which form of salt would you expect to stay on the road longer: rock salt (larger crystals) or table salt (smaller crystals)? Give reasons for your answer.